

REGENT UNIVERSITY
COLLEGE OF SCIENCE AND TECHNOLOGY



EXAMINATION PAPER

END-OF-SEMESTER EXAMINATIONS

APRIL 2011

**COURSE: OBJECT-ORIENTED PROGRAMMING
USING C++ (M)**

COURSE CODE: SICS 1523

**LEVEL: 100 (COMPUTER SCIENCE & INFORMATION
SYSTEM SCIENCES)**

TIME: 2½ HOURS

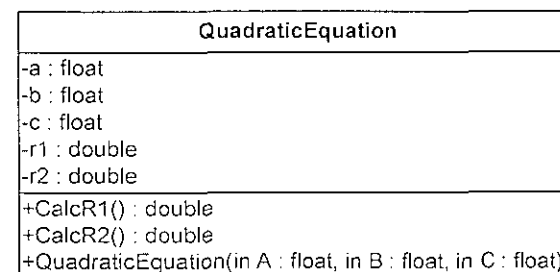
LECTURER: KENNETH K. AZUMAH

READ ALL INSTRUCTIONS VERY CAREFULLY

Answer any four questions. All questions carry equal marks.
Recommended time for each question: 30 mins

Question 1 [15 marks]

The following UML diagram shows a Quadratic Equation which encapsulates the polynomial $ax^2 + bx + c = 0$. The class has five attributes (data members), two operations (member functions) and two constructors (custom and default).



CalcR1() returns the value of r1 calculated as $r1 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$

CalcR2() returns the value of r2 calculated as $r2 = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$

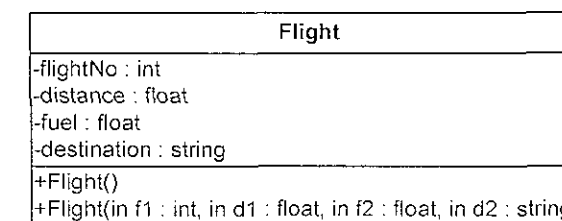
The custom constructor initializes the attributes a, b and c only.

Translate the class diagram fully into C++ code.

Hint: the in-built sqrt() function is used for finding the square-root of an expression

Question 2 [15 marks]

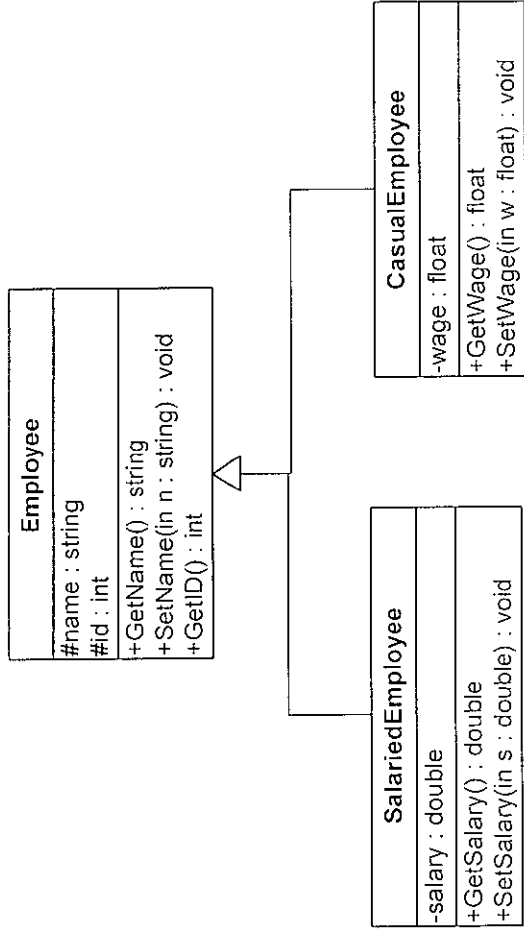
(a) Redraw the class diagram below and complete it by adding accessors and mutators for each attribute. [4 marks]



(b) Convert the completed class diagram into C++ code fully implementing the accessors and mutators. [11 marks]

Question 3 [15 marks]

Study the UML structure below carefully and write C++ code to fully implement the classes.



Question 4 [15 marks]

Consider carefully the C++ code below which show four classes and a main programme.

- (a) Walk through the main() and write down the **output** of the programme [9 marks]
- (b) What object-oriented property or properties is/are being portrayed in the code? Explain your answer. [6 marks]

Programme Code Starts

```

#include <iostream>
#include <string>
using namespace std;
  
```

```

class Shape {
public:
    virtual float GetArea() = 0;
    Shape() {cout << "Shape Constructor called"
    << endl;}
};

class CRectangle: public Shape{
private:
    float length, breadth;
public:
    float GetArea(){ return length * breadth;}
    CRectangle(){ length = breadth = 0;}
    CRectangle(float length, float breadth) {
        this->length = length;
        this->breadth = breadth;
    }
};

class CTriangle: public Shape{
private:
    float base, height;
public:
    float GetArea() { return base * height *
    0.5;}
    CTriangle(){ base = height = 0;}
    CTriangle(float base, float height) {
        this->base = base;
        this->height = height;
    }
};

class COval: public Shape {
private:
    float minorRadius, majorRadius;
public:
    float GetArea() {
        return 0.25 * minorRadius * majorRadius;
  
```

```

}
COval(){ minorRadius = majorRadius = 0;}
COval(float r1, float r2){
    minorRadius = r1;
    majorRadius = r2;
}

};

int main(){
    COval oval = COval(2.0,4.0);
    CTriangle tri = CTriangle(5.0, 2.0);
    CRectangle rect = CRectangle(2.0, 5.0);

    Shape * s[] = {&oval, &tri, &rect};

    for (int j = 2; j >=0; j--){
        cout << s[j]->GetArea() << endl;
    }
    system("pause");
    return 0;
}

```

Programme Code Ends

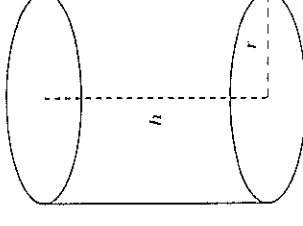
Question 5 [15 marks]

Draw the UML class diagram(s) for the code in **Question 4** above. Show all the relationships between the class diagrams. Pay special attention to the UML representation.

Question 6 [15 marks]

Consider the cylinder shown in the figure on the right and implement a **class** in C++ code along the following guidelines:

- Determine the necessary attributes and their data types [2 marks]
- Create accessor and mutator functions for each of the attributes identified [8 marks]
- Create a parameterized constructor that will initialize all the attributes of the cylinder [2 marks]
- Add a default constructor (non-parameterized) that will initialize all the attributes of the cylinder [3 marks]



(a) $\log_2 81 - \log_2 25$ (b) $\log_2 12 + \log_2 4$ (c) $\log_2 15$

6. (a) A 16 – team bowling league has \$8000 to be awarded as prize money. If the team is awarded \$ 275 in prize money and the award increases by the same amount for successive finishing place, how much will the first team receive?

(b) A storekeeper's list price is 50 percent above the cost of an item and she allows a trade discount of 20 percent from the list price. What is her profit percent?

7. Suppose Love invested \$1000 at an annual rate of interest of 8%. Compute the balance she obtains after 10 years in each of the following cases:

- (a) the interest is simple interest
- (b) the interest is compounded quarterly
- (c) the interest is compounded annually.

8. How quickly will money double if it is invested at an annual interest rate of 8 % and the interest is compounded?

- (a) quarterly
- (b) continuously.

9. Mr. and Mrs. Fredua Agyeman decided to buy a house and agreed to pay \$3000 at the end of the first year, \$3500 at the end of the second year, \$4000 at the end of the third year, and so on. How much do they pay if twenty payments were made?

10. (a) An appointment for Executive position carries a salary of ₦18,000,000 per annum and rises annually with an increment of ₦1,200,000 to ₦26,400,000. If the position is held by Rev Osei for 20,years, find his total earnings.

(b) The total cost of production of an output is given by $Y= 25 + 6X$, where x is the quantity produced. If the price is fixed at ₦11, what is the value of output at break – even point; and what is the net revenue if 20 units of output are produced?

11. The value of a certain production machine at the end of each year of operation is 80% as much as its value at the beginning of the year. If the machine originally cost \$10,000, find its value at the end of 10 years.

REGENT UNIVERSITY COLLEGE OF SCIENCE AND TECHNOLOGY

END OF FIRST TRIMESTER EXAMINATIONS

WEEKEND SCHOOL

SOAC 157 QUANTITATIVE TECHNIQUES

LECTURER: Frank Osei-Gyimah

3hrs.

March 2006

INSTRUCTIONS: ANSWER ALL QUESTIONS

1. Solve each of the following.

(a) $\frac{3}{4} = \frac{x}{8}$ (b) $\frac{10}{a} = \frac{20}{28}$ (c) $\frac{(x+2)}{5} = \frac{7}{5}$ (d) $\frac{14}{10} = \frac{(5-x)}{(x-3)}$

2. (a) A 96-mile trip requires 6 gallons of gasoline. At that rate, how many gallons would require for a 152 mile trip?

(b) What number is 40% of 80?

(c) Find 81% of 32

(d) Suppose 6% of 8000 people polled regarding an election expressed a no opinion. How many people had an opinion? Express the no polled opinion as a fraction of the yes polled.

3. Simplify, leaving your answer in an exponent form:

(a) $10^{(3x-1)} 10^{(4-x)}$ (b) $(2^x 3^y)^z$ (c) $\frac{(27x^2 y^{-3})^{1/3}}{(8x^{-4} y^3)^{1/3}}$

4. Solve for x:

(a) $5^{3x} = 5^{4x-2}$ (b) $\log_2 x = 5$ (c) $9^{x-1} = 3^x$ (d) $25^{x+1} = 125^{2x}$

5. Given that $\log_2 3 = 1.585$ and $\log_2 5 = 2.3219$, evaluate the following: